

Special Publication No. 05-14

Upper Cook Inlet Commercial Herring and Smelt Fisheries through 2004

by

Pat Shields

September 2005

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative		fork length	FL
deciliter	dL	Code	AAC	mideye-to-fork	MEF
gram	g	all commonly accepted		mideye-to-tail-fork	METF
hectare	ha	abbreviations	e.g., Mr., Mrs., AM, PM, etc.	standard length	SL
kilogram	kg			total length	TL
kilometer	km	all commonly accepted			
liter	L	professional titles	e.g., Dr., Ph.D., R.N., etc.	Mathematics, statistics	
meter	m			<i>all standard mathematical</i>	
milliliter	mL	at	@	<i>signs, symbols and</i>	
millimeter	mm	compass directions:		<i>abbreviations</i>	
		east	E	alternate hypothesis	H _A
		north	N	base of natural logarithm	<i>e</i>
		south	S	catch per unit effort	CPUE
		west	W	coefficient of variation	CV
		copyright	©	common test statistics	(F, t, χ^2 , etc.)
		corporate suffixes:		confidence interval	CI
		Company	Co.	correlation coefficient	
		Corporation	Corp.	(multiple)	R
		Incorporated	Inc.	correlation coefficient	
		Limited	Ltd.	(simple)	r
		District of Columbia	D.C.	covariance	cov
		et alii (and others)	et al.	degree (angular)	°
		et cetera (and so forth)	etc.	degrees of freedom	df
		exempli gratia		expected value	<i>E</i>
		(for example)	e.g.	greater than	>
		Federal Information		greater than or equal to	≥
		Code	FIC	harvest per unit effort	HPUE
		id est (that is)	i.e.	less than	<
		latitude or longitude	lat. or long.	less than or equal to	≤
		monetary symbols		logarithm (natural)	ln
		(U.S.)	\$, ¢	logarithm (base 10)	log
		months (tables and		logarithm (specify base)	log ₂ , etc.
		figures): first three		minute (angular)	'
		letters	Jan, ..., Dec	not significant	NS
		registered trademark	®	null hypothesis	H ₀
		trademark	™	percent	%
		United States		probability	P
		(adjective)	U.S.	probability of a type I error	
		United States of		(rejection of the null	
		America (noun)	USA	hypothesis when true)	α
		U.S.C.	United States	probability of a type II error	
			Code	(acceptance of the null	
		U.S. state	use two-letter	hypothesis when false)	β
			abbreviations	second (angular)	"
			(e.g., AK, WA)	standard deviation	SD
				standard error	SE
				variance	
				population	Var
				sample	var
Weights and measures (English)					
cubic feet per second	ft ³ /s				
foot	ft				
gallon	gal				
inch	in				
mile	mi				
nautical mile	nmi				
ounce	oz				
pound	lb				
quart	qt				
yard	yd				
Time and temperature					
day	d				
degrees Celsius	°C				
degrees Fahrenheit	°F				
degrees kelvin	K				
hour	h				
minute	min				
second	s				
Physics and chemistry					
all atomic symbols					
alternating current	AC				
ampere	A				
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity	pH				
(negative log of)					
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

SPECIAL PUBLICATION NO. 05-14

**UPPER COOK INLET COMMERCIAL HERRING AND SMELT
FISHERIES THROUGH 2004**

by

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September 2005

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This document should be cited as:

Shields, P. 2005. Upper Cook Inlet commercial herring and smelt fisheries through 2004. Alaska Department of Fish and Game, Special Publication No. 05-14, Anchorage.

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ABSTRACT

Since 1973 the Alaska Department of Fish and Game has managed commercial and personal use Pacific herring *Clupea pallasii* fisheries in the Upper Cook Inlet Management Area. Both subsistence and personal use fisheries for smelt also occur in Cook Inlet targeting both longfin smelt *Spirinchus thaleichthys* and eulachon *Thaleichthys pacificus*. The Upper Cook Inlet Management Area encompasses all costal waters in that portion of Cook Inlet north of the latitude of Anchor Point and is divided into 2 Districts. This report summarizes the history of the Upper Cook Inlet commercial and personal use herring and smelt fisheries.

Key words: Upper Cook Inlet, Pacific herring, *Clupea pallasii*, commercial fishery, personal use fishery, smelt, *Spirinchus thaleichthys*, eulachon, *Thaleichthys pacificus*, stock status, Alaska Board of Fisheries

INTRODUCTION

The Upper Cook Inlet (UCI) Management Area consists of all marine waters in that portion of Cook Inlet north of the latitude of Anchor Point and is divided into 2 fishing districts, the Central and Northern Districts (Figure 1). The Central District is approximately 75 miles long, averages 32 miles in width and is further subdivided into 6 Subdistricts. The Northern District is 50 miles long, averages 20 miles in width and is divided into 2 Subdistricts.

Commercial herring *Clupea pallasii* fishing began in UCI in 1973 with a modest harvest of bait quality fish along the east side of the Central District and expanded in the late 1970s to include small scale sac-roe fisheries in Chinitna and Tuxedni bays along the west side of Cook Inlet (Table 1). All herring harvested in UCI were caught during the sac-roe season (April 15 to June 30), however, while herring harvested in Chinitna Bay and Tuxedni Bay were sold primarily for sac-roe, most of the herring harvested from the east side (Upper Subdistrict) was and still is utilized as bait. Currently, 100% of the herring harvest in all of UCI is kept for personal use or sold for bait.

Smelt returns to Upper Cook Inlet occur in many of the larger river systems, with particularly large returns to the Susitna and Kenai rivers. Both longfin smelt *Spirinchus thaleichthys* and eulachon *Thaleichthys pacificus* are documented in Cook Inlet. Eulachon begin returning to spawning areas in Cook Inlet generally from mid-May to mid-June and return in quantities large enough to support limited commercial fisheries. Longfin smelt return to Cook Inlet in the fall of the year and are not likely to be targeted for commercial purposes due to much smaller numbers of fish.

HERRING

Gillnets, both set and drift, are the only legal herring gear in UCI, except in Chinitna Bay where only set gillnets can be used. Mesh size in this fishery is restricted to at least 2.125 inches but no more than 2.5 inches. In the set gillnet fishery, no net may exceed 35 fathoms (210 feet) in length. Each set gillnet permit holder is allowed to operate a total of 105 fathoms of gear in the aggregate. In the drift gillnet fishery, no net may exceed 150 fathoms.

Historically, few drift gillnets were used in these herring fisheries and most were generally confined to Tuxedni Bay. Herring harvests in the Upper Subdistrict are generally concentrated in the Clam Gulch area with little effort north of the Kasilof River. Prior to action taken at the 1992 Alaska Board of Fisheries (BOF) meeting, the herring fishery was open in the Upper Subdistrict from April 15 to June 30, 7 days per week, 24 hours per day. Since 1982 this area was closed by emergency order at the end of May each year, with harvests ranging from

approximately 6 tons in 1976 to 179 tons in 1986 (Table 1). In the west side fisheries, herring harvests were primarily from the Snug Harbor and Magnetic Island areas of Tuxedni Bay, Clam Cove, and Camp Point in Chinitna Bay. Again, prior to the action taken at the 1992 BOF meeting, the west side herring fisheries were open from April 22 to June 30, 7 days per week, 24 hours per day. Herring harvests from the west side of Cook Inlet range from approximately 122 tons in 1989 to 10 tons in 1992 at Chinitna Bay and approximately 238 tons in 1983 to 2 tons in 1991 at Tuxedni Bay.

From 1980–1992 an average of 270 interim use permits were issued per year in the UCI commercial herring fishery with 70 permits fished per year, (Tables 1–3) for an average yearly total gross earnings of \$125,000. Since the commercial fishery reopened in 1998, the average yearly number of permits issued fell to 49 with an average of 12 permits fished per year, for average yearly total gross earnings of approximately \$14,250. In the Upper Subdistrict herring fishery, the average number of permits fished from 1975–1992 was more than 30 (Table 3) and the average number of days that the fishery was open was 57 days. Since reopening in 1998, the average number of permits fished each year has been approximately 13 and the average number of days that the fishery has been open is 9 days.

Herring fishery management in UCI is complicated by turbid waters, which are a result of many glacial streams flowing into Cook Inlet. These turbid waters preclude the use of aerial surveys, which have been the common method used to estimate biomass of herring populations. Therefore, it has been necessary to use harvest statistics and age-class composition data obtained from harvest sampling in order to make assessments about UCI herring stocks. Beginning in the mid-1980s, informal guideline harvest levels were established in each area of UCI. Estimates of stock status using catch per unit of effort (CPUE) and age class composition of the harvest were used to adjust the guideline harvest level up or down in small increments to achieve a long-term harvest level that could be sustained in each area.

In 1991, a trend of decreasing abundance and a progressive shift towards older age class herring was observed in Tuxedni Bay, indicating a lack of recruitment (Table 4). The 1992 season resulted in the closure of this area by emergency order. In Chinitna Bay and along the beaches of the Upper Subdistrict, similar, although less severe trends were observed by the end of the 1992 season. As a result of this decline, an Alaska Department of Fish and Game (ADF&G) proposal to the BOF to open the UCI herring fishery by emergency order only was submitted. This proposal was adopted and became regulation for the 1993 season, ending a long period with fixed opening dates of April 15 in the Upper Subdistrict and April 22 on the west side of Cook Inlet. ADF&G kept the fisheries closed until the herring stocks recovered to a level that could sustain modest harvests. The Upper Subdistrict fishery was not fished for 5 years, while the Chinitna Bay and Tuxedni Bay fisheries remained closed for a decade.

When the proposal to alter the herring fishery was submitted in 1992, the BOF was informed that this closure would be for a minimum of 3 years. However, ADF&G delayed any reopening until 1998 to give the herring stocks one full spawning cycle of protection. After a 5 year closure, the fishery reopened on the east side in 1998, and beginning in 1999, it was conducted under the Central District Herring Recovery Management Plan (CDHRMP). The primary change, as a result of the new management plan, involved restructuring the fishery to no more than two 30-hour periods per week, beginning on Mondays and Thursdays. The set gillnet fishery on the east side of Cook Inlet was to occur only in the waters of the Upper Subdistrict and the season was shortened to April 20 to May 20. At the 2001 BOF meeting, the season closure date was

modified to May 31. The CDHRMP also required all fishermen who wished to participate in the commercial herring fishery to register their intent to do so no later than April 10, they were also required to report their harvest within 12 hours of the closure of each fishing period. The guideline harvest range for the fishery was set at 0–40 tons. In order to reduce the incidental harvest of salmon and char, no fishing was allowed in the near shore area within 600 feet of the mean high tide mark.

The 1998 season showed improvement with a harvest of nearly 19.5 tons of herring. Since reopening, the average yearly harvest has been approximately 14 tons. Age composition from scale samples has shown the population to be comprised primarily of 4 to 8 year old fish, with few herring older than 8 years (Tables 5–7). It should be noted that herring sampled from gillnet harvests result in a biased sample; many smaller and younger fish are not caught by this type of gear. No incidental harvest of Chinook salmon *Oncorhynchus tshawytscha* has been observed in the UCI herring fishery, while incidental harvest of sockeye salmon *O. nerka* and Dolly Varden char *Salvelinus malma* has been minimal with only a few observed. Eulachon are often encountered in significant numbers, but only 20% of a permit holder's entire catch per period may be retained in allowable non-target species. Harvests of other non-target species include Pacific Sandfish *Trichodon trichodon*, Starry Flounder *Platichthys stellatus* and Spiny Dogfish *Squalus acanthias*. Non-target fish are released, but the rate of survival has not been estimated.

At the time of its formulation, the CDHRMP provided guidelines for ADF&G to allow a herring fishery in Chinitna and Tuxedni Bays, but only if ADF&G had assessed the age composition and determined that a healthy stock structure existed. The fishery could be reopened by emergency order and was to be managed in order to ensure sustained yield. Similar to the fishery in the Upper Subdistrict, these fisheries would take place from April 20 to May 20 with two 30-hour periods per week. The guideline harvest range for Chinitna Bay was 0–40 tons and for Tuxedni Bay 0–50 tons. These fisheries were reopened in 2002 based on sampling from the previous year (Table 6). Since both fisheries reopened, effort levels have been low due to the reluctance of permit holders to travel to remote areas.

PERSONAL USE HERRING FISHERIES

Personal use herring fishing is also allowed in Cook Inlet. Managed under 5AAC 77.531 Personal Use Herring Fishery, the season is from April 1 through May 31 in the Northern and Central Districts. Only gillnets or dip nets may be used, however in Turnagain Arm east of a line from Point Possession to Point Campbell, gillnets may not be used. Gillnets may not exceed 20 feet in length and 2 inches in mesh size and must be attended at all times. Staff have not documented the level of participation or harvest. A permit is not required nor is harvest data collected during the Statewide Harvest Survey (SWHS).

BOF HERRING PROPOSALS

The BOF has 2 proposals at this meeting that seek changes to the CDHRMP. Proposal 138 requests that the Kalgin Island Subdistrict be reopened to commercial herring fishing. No harvest quotas are listed in this proposal. This area was open prior to the 1992 closure, but ADF&G kept no records of sales or participation from this area. Therefore, when the CDHRMP was enacted, neither the Northern District or Kustatan and Kalgin Island Subdistricts were included because the lack of data led biologists to believe that no previous harvests had come from these areas.

Proposal 139 seeks to modify the CDHRMP, expanding the time period that fishing is allowed from two 30-hour periods per week to one period no longer than 108 hours, (i.e., from Monday at 6:00 a.m. until Friday at 6:00 p.m). Since the current guideline harvest range of 0–40 tons will not change, the rationale presented is that the extra time will not change the fishery. ADF&G supports both of these proposals with the following provisions. In the Kalgin Island Subdistrict, we recommend a guideline harvest range of 0–40 tons as well as retaining all gear and time restrictions that are listed for other UCI herring fisheries. We also support the additional fishing time requested in Proposal 139 because this fishery has a conservative harvest range of 0–40 tons. The additional time proposed may result in more permit holders participating in the fishery, but the harvest limit should provide ample protection for UCI herring stocks.

SMELT

Prior to adoption of 5AAC 39.212 Forage Fish Management Plan, the entire Upper Cook Inlet area was open to smelt fishing from October 1 to June 1. The only documented commercial harvest of eulachon occurred in 1978, 1980, 1998, and 1999, with catches of 300, 4,000, 18,900, and 100,000 pounds, respectively. Prior to 1998, almost any method and gear type was legal, however, there was some confusion regarding legal gear for harvest of eulachon. Interested fishermen were mistakenly told that gillnets were the only legal gear. Because primary markets required undamaged fish for bait or marine mammal food, this harvest method was unacceptable. In 1998, when the mistake in regulation interpretation was changed and dip nets were allowed, harvests increased to 19,000 pounds and in 1999, the last year of the fishery, 100,000 pounds were harvested, which was the fishery harvest limit at the time. All harvests occurred in salt water near the Susitna River. While no quantitative assessment of the Susitna River smelt stocks has been conducted, they would undoubtedly be measured in thousands of tons, likely even tens of thousands of tons.

At the 1998 BOF meeting, the commercial eulachon fishery was closed, but the regulation did not take effect until after the 1999 season. In 2000, as part of its draft Forage Fish Management Plan, ADF&G recommended that smelt fishing be restricted to the General Subdistrict of the Northern District. Legal gear would be dip nets only, which had the benefit of eliminating non-target species harvest. The area open to fishing was designed to target Susitna River smelt stocks. In this draft policy, ADF&G recommended that active forage fish fisheries be allowed to take place in a tightly controlled and closely monitored manner through the use of an ADF&G Commissioner's Permit, while not allowing any "new" fisheries to begin. The intent was to allow the active low-level fisheries to continue, but prevent them from growing without limit. The harvest in this fishery would be maintained at a low level. When the BOF adopted the current Forage Fish Management Plan, they chose to close the entire commercial smelt fishery.

PERSONAL USE SMELT FISHERIES

Both subsistence and personal use fishing are allowed for smelt in Cook Inlet. In compliance with 5AAC 01.599 Subsistence Smelt Fishery, smelt may be taken for the purpose of subsistence in salt water from April 1 through May 31 and then again from September 1 through October 30. In fresh water, the season is from April 1 through June 15. There are no bag or possession limits. Legal gear consists of gillnets and dip nets in both fresh and salt water. In salt water, gillnets may not exceed 50 feet in length and 2 inches in mesh size; in fresh water, gillnets may not exceed 20 feet in length and 2 inches in mesh size. Subsistence fishing may only occur in those waters designated for subsistence, which are limited and defined in 5AAC 99.015(a)(3).

Personal use fishing for smelt is managed under 5AAC 77.527. There are no bag or possession limits and smelt may be taken with dip nets in salt water from April 1 through May 31 and in fresh water from April 1 through June 15. Drift gillnets may be used only from April 1 through May 31 in both salt and fresh water, but they may not be more than 20 feet in length, 4 feet in depth, and 1.5 inches in mesh size, and must be attended at all times. The two most significant areas where smelt are harvested in personal use fisheries occur in the Twentymile River (and shore areas of Turnagain arm near Twentymile River) and Kenai River. Other areas where smelt are harvested include the Big and Little Susitna River, Deshka River, Placer River, Yentna River, and shoreline areas of Turnagain Arm and Cook Inlet north of the Ninilchik River. Table 8 shows the personal use harvest of smelt, as reported through the SWHS, and estimates that annual harvests have ranged from 2.2 to 5 tons over the past decade. The personal use smelt harvest is possibly under-reported as some participants may confuse harvests as being subsistence and not personal use. Currently, no subsistence records are kept for smelt or herring harvests.

BOF SMELT PROPOSALS

The BOF has 4 smelt (eulachon) proposals to consider at the January 2005 meeting. All 4 proposals seek to reopen the commercial smelt fishery in UCI. The primary commercial markets for smelt are 1) as food for human consumption, 2) as bait for the sturgeon sport fishery in the Pacific Northwest, and 3) as food for captive marine mammals. Proposal numbers 134 and 135 are replicates of each other and propose a commercial fishery with dip nets from the Chuit River to the Little Susitna River including the Deshka River Landing within the Susitna River. The season would occur from May 1 to June 30 and have a harvest limit of 100 tons. Proposal 136 is very similar to 134 and 135; the only difference is that the area from the mouth of the Susitna River to the Deshka Landing is not included, and the fishery would be limited to no more than 150 tons. Finally, Proposal 137 seeks to establish a commercial smelt fishery through an ADF&G issued Commissioner's Permit. All guidelines for the fishery would be set through the permit process.

Although ADF&G has not conducted any assessment activities on these stocks, anecdotal information indicates a harvestable surplus of these stocks does exist. Because of the dip net gear type, there are few, if any allocative impacts to other users. ADF&G recommended in 1998 that the harvest limit be set at 50 tons until a general assessment of stock strength could be made. However, because the Forage Fish Management Plan currently does not allow for the commercial harvest of smelt, ADF&G is NEUTRAL on these proposals.

TABLES AND FIGURES

Table 1.—Commercial herring harvest by area, Upper Cook Inlet, 1973–2004.

Year	Harvest (Tons)			Total
	Eastside	Chinitna Bay	Tuxedni Bay	
1973	13.8	-	-	13.8
1974	36.7	-	-	36.7
1975	6.2	-	-	6.2
1976	5.8	-	-	5.8
1977	17.3	-	-	17.3
1978	8.3	55.3	-	63.6
1979	67.3	96.2	24.8	188.3
1980	37.4	20.0	86.5	143.9
1981	86.2	50.5	84.9	221.6
1982	60.2	91.8	50.2	202.2
1983	165.3	49.2	238.2	452.7
1984	117.5	90.6	159.0	367.1
1985	121.7	47.4	220.5	389.6
1986	178.9	111.1	191.9	481.9
1987	130.5	65.1	152.5	348.1
1988	50.7	23.4	14.1	88.2
1989	55.2	122.3	34.3	211.8
1990	55.4	55.9	16.1	127.4
1991	13.4	15.7	1.6	30.7
1992	24.7	10.4	-	35.1
1993	-	-	-	-
1994	-	-	-	-
1995	-	-	-	-
1996	-	-	-	-
1997	-	-	-	-
1998	19.5	-	-	19.5
1999	10.4	-	-	10.4
2000	14.7	-	-	14.7
2001	9.9	-	-	9.9
2002	16.2	1.9	0	18.1
2003	3.7	0	0	3.7
2004	6.7	0.1	0	6.8

Note: Years that the fishery was closed are indicated by a dash.

Table 2.—Number of permits issued and number fished in the Upper Cook Inlet commercial herring fishery, 1980–2004.

Year	Number of Permanent Permits Issued to Residents	Number of Permanent Permits Issued to Non-residents	Total Number of Permits Issued	Total Number of Permits Fished in UCI
1980	267	15	282	
1981	249	11	260	
1982	259	13	272	
1983	61	11	72	
1984	228	7	235	
1985	245	7	252	112
1986	248	6	254	114
1987	323	34	357	147
1988	371	17	388	129
1989	302	9	311	89
1990	276	9	285	104
1991	209	10	219	43
1992	152	3	155	26
1993	65	4	69	0
1994	39	2	41	0
1995	33	2	35	0
1996	23	1	24	0
1997	19	2	21	0
1998	63	1	64	18
1999	76	40	116	10
2000	41	1	42	13
2001	35	0	35	13
2002	41	1	42	16
2003	38	0	38	8
2004	28	0	28	8

Note: Fishery closed from 1993 through 1997.

Table 3.—Number of permits fished and number of days the fishery was open in the Cook Inlet Upper Subdistrict herring fishery, 1973–2004.

Year	Number of Permits Fished	Number of Days Open
1973		76
1974		76
1975	^a	76
1976	2	76
1977	9	76
1978	21	76
1979	52	61
1980	26	56
1981	39	55
1982	31	55
1983	45	37
1984	40	47
1985	37	47
1986	25	47
1987	43	47
1988	42	43
1989	40	47
1990	41	46
1991	33	40
1992	16	47
1993	-	-
1994	-	-
1995	-	-
1996	-	-
1997	-	-
1998	18	18
1999	10	18
2000	13	18
2001	13	18
2002	15	24
2003	8	24
2004	7	25

Note: Years that the fishery was closed are indicated by a dash.

^a Data confidential under Alaska Statute 16.05.815.

Table 4.—Age composition (by percentage) of commercially harvested herring in Upper Cook Inlet, 1982–1992.

Tuxedni Bay											
Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.4	0.0	3.7	0.0	0.8	0.3	0	0.0	0		
4	1.1	4.8	19.2	0.9	11.5	21.6	15.7	2.2	1.0	0.6	
5	10.2	10.2	18.4	9.6	30.0	7.8	74.0	50.6	12.3	11.3	
6	27.0	25.1	30.1	44.0	30.3	24.5	2.8	40.7	55.4	29.7	
7	33.2	27.6	14.5	15.3	13.3	19.6	2.8	3.2	27.0	44.8	
8	23.7	20.5	9.2	17.7	7.7	12.6	1.5	2.0	3.3	11.6	
9	4.4	11.8	5.0	12.6	6.4	3.3	1.8	0.5	1.1	1.5	
10						6.0	0.5	0.7	0.3	0.3	
11+						4.2	0.9			0.0	
Chinitna Bay											
Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2					1.1			0			0
3	0	0	0.3	0	0.4	1.7		0			0
4	0.5	9.5	17	2.3	20.6	21.2	7.4	1.5	1	2.8	4.3
5	10.5	13.7	20.3	12.7	34.7	5.4	58.3	28.3	16	10.1	7.8
6	32	39.3	34	32	22.4	30.5	6	49.8	37	27.3	13.8
7	23.3	20.1	13.7	17.6	10.5	18.1	13.4	6.5	36.1	40.6	19
8	27.4	14	10.1	9.3	6.1	13.3	7.7	7.3	4.2	13.5	25.9
9	6.4	3.4	4.6	16.1	4.3	4	6.2	3.9	4	2.8	23.3
10	0					4.2	0.5	1.9	1.1	2.3	1.7
11	0					1.7	0.2	0.7	1.3	0.3	2.6
12							0.2	0.1	0.3	0.3	1.7
Eastside											
Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0		0.4	0		0.8		0.2		0.7	0.5
4	0	2.9	12.9	0.5		13.4	3.6	5.9	1.3	0	0
5	12.2	7.3	11.6	7.5		7.6	30	31.4	14	9	2.7
6	28.6	52.8	50.3	29.4		9.7	10.9	31.1	32.4	34.3	19.6
7	34.1	22.3	14.3	14.6		22.7	12.7	9.3	37	37	38
8	16.4	10.5	7.9	38.7		28.6	12.7	6.6	7.1	13.8	27.7
9	8.6	4.2	2.5	9.3		6.7	14.5	7.6	3.2	1.4	8.7
10	0					7.1	5.5	3.9	3	2.1	1.6
11	0					3.4	10	2.7	2.1	1	0.5
12								1.2	0.3	0.3	0
13									0.3	0.3	0.5

Table 5.—Summary of age, sex, and size distribution of Pacific herring sampled by gillnet in the Upper Subdistrict of Cook Inlet, 1998–2004.

Sample Region	Age (Years)	Numbers of Fish				Weight			Length		
		No. Male	No. Female	Total	Percent	Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
1998	3	0	0	0	0.0						
Upper Subdistrict	4	2	7	9	1.3	122	7.8	9	215	4.2	9
	5	60	116	176	24.9	143	16.1	176	229	7.6	176
	6	105	225	330	46.7	155	18.5	330	234	8.6	330
	7	36	54	90	12.7	176	20.2	90	244	7.2	90
	8	31	57	88	12.5	184	23.3	88	247	8.6	88
	9	6	5	11	1.6	187	28.7	11	246	6.4	11
	10	0	1	1	0.1	194	0.0	1	254	0.0	1
	11	1	0	1	0.1	186	0.0	1	255	0.0	1
Sample Total		241	465	706	100	159		706	236		706
Sex Composition		34.1%	65.9%	100%							
1999	3	1	0	1	0.2	99	0.0	1	211	0.0	1
Upper Subdistrict	4	7	13	20	4.8	123	11.3	20	219	6.4	20
	5	37	68	105	25.1	143	18.2	105	231	9.8	105
	6	62	111	173	41.3	153	18.8	173	237	8.6	173
	7	33	43	76	18.1	160	23.0	76	238	9.9	76
	8	10	25	35	8.4	176	26.5	35	248	10.0	35
	9	4	5	9	2.1	195	12.2	9	255	4.5	9
	10	0	1	1	0.2	222	0.0	1	259	0.0	1
	11				0.0						
Sample Total		153	266	419	100	154		419	236		419
Sex Composition		36.5%	63.5%	100%							
2000	3				0.0						
Upper Subdistrict	4	6	18	24	2.0	130	22.6	24	218	16.1	24
	5	54	40	94	7.9	145	30.2	92	232	14.6	94
	6	164	156	320	26.8	150	25.8	274	236	12.7	320
	7	202	234	436	36.5	157	27.1	408	238	13.9	436
	8	106	98	204	17.1	164	29.2	190	242	13.0	204
	9	36	48	84	7.0	170	23.5	82	246	11.8	84
	10	16	14	30	2.5	180	42.8	30	248	19.7	30
	11	0	2	2	0.2	236	0.0	2	132	0.0	2
Sample Total		584	610	1,194	100	157		1,102	238		1,194
Sex Composition		48.9%	51.1%	100%							
2001	3	2	1	3	1.5	108	11.2	3	201	6.4	3
Upper Subdistrict	4	5	7	12	5.8	121	19.6	12	209	8.6	12
	5	15	27	42	20.4	150	21.3	42	222	9.0	42
	6	26	20	46	22.3	168	17.1	46	231	8.5	46
	7	28	28	56	27.2	181	18.9	56	237	7.8	56
	8	19	16	35	17.0	186	28.2	35	238	8.4	35
	9	4	6	10	4.9	219	31.8	10	248	5.7	10
	10	2	0	2	1.0	227	0.0	2	251	0.0	2
Sample Total		101	105	206	100.0	171		206	232		206
Sex Composition		49.0%	51.0%	100%							

-continued-

Table 5.–Page 2 of 2.

Sample Period	Age (Years)	Numbers of Fish			Percent of Total	Weight			Length		
		No. Male	No. Female	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
2002	3	0	1	1	0.4	92	0	1	197	0	1
Upper Subdistrict	4	2	10	12	4.3	133	17	12	214	8	12
	5	22	36	58	20.7	147	21	58	222	10	58
	6	22	37	59	21.1	163	22	59	234	9	59
	7	25	28	53	18.9	174	20	53	239	8	53
	8	22	23	45	16.1	182	23	45	244	9	45
	9	16	20	36	12.9	192	22	36	243	10	36
	10	10	4	14	5.0	193	22	14	245	9	14
	11	2	0	2	0.7	180	0	2	249	0	2
Sample Total		121	159	280	100%	162		280	232		280
Sex Composition		43%	57%	100%							
2003	3	3	3	6	6.2	109	13	6	194	2	6
Upper Subdistrict	4	24	26	50	51.5	125	13	50	199	7	50
	5	5	13	18	18.6	135	13	18	207	5	18
	6	7	9	16	16.5	146	21	16	220	11	16
	7	2	4	6	6.2	144	21	6	221	11	6
	8	0	1	1	1.0	255		1	252		1
	9										
	10										
	11										
Sample Total		41	56	97	100%	132		97	206		97
Sex Composition		42%	58%	100%							
2004	3	4	3	7	2.6	112	2.9	7	193	2.3	7
Upper Subdistrict	4	31	64	95	35.2	127	19.9	95	205	10.5	95
	5	27	64	91	33.7	137	21.6	91	212	11.3	91
	6	27	24	51	18.9	141	20.7	51	218	12.1	51
	7	10	10	20	7.4	160	15.9	20	227	6.3	20
	8	2	1	3	1.1	138	0.0	3	217	0.0	3
	9	1	0	1	0.4	192	0.0	1	240	0.0	1
	10		0		0.0			0			0
	11		1	1	0.4	210	0.0	1	241	0.0	1
	12		1	1	0.4	131	0.0	1	202	0.0	1
Sample Total		102	168	270	100.0	136		270	212		270
Sex Composition		38%	62%	100%							

Table 6.—Summary of age, sex, and size distribution of Pacific herring sampled by gillnet in Chinitna Bay, 2001, 2002 and 2004.

Sample Region	Age	Numbers of Fish						Percent of Total	Weight ^a			Length		
		Male	Imm. ^b Female	Ripe ^c Female	Spawned ^d Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
2001 Chinitna Bay	3	1	0	2	0	0	3	1	102	18.8	3	202	1.2	3
	4	14	0	35	0	0	49	12	135	13.9	49	218	8.6	49
	5	92	0	135	2	0	229	56	148	142.4	229	224	8.0	229
	6	22	0	8	14	0	44	11	160	95.2	44	235	10.5	44
	7	26	0	10	15	0	51	13	169	92.5	51	242	7.5	51
	8	14	0	3	9	0	26	6	184	99.5	26	245	8.4	26
	9	2	0	1	1	0	4	1	240	152.2	4	252	6.0	4
	10	1	0	0	0	0	1	0.2	182	0.0	1	251	0.0	1
Sample Total		172	0	194	41	0	407	100	153		407	228		407
Sex Composition		42.3%		47.7%	10.1%									
Sample dates = May 14, 17, & 21, 2002														
2002 Chinitna Bay	3													
	4	7		9			16	6	133	10.3	16	216	2.3	16
	5	44		40			84	34	148	19.0	84	228	8.1	84
	6	81		42			123	49	160	17.8	123	233	7.7	123
	7	10		2			12	5	175	27.1	12	241	8.6	12
	8	8		0			8	3	186	18.9	8	247	7.2	8
	9	4		3			7	3	218	28.8	7	252	7.0	7
	10 11													
Sample Total		154		96			250	100	158		250	232		250
Sex Composition		62%		38%										
Sample date = May 28, 2004														
2004 Chinitna Bay	3	2		2			4	3	119	8.5	4	206	10.8	4
	4	20		41			61	44	126	14.9	61	208	8.9	61
	5	21		35			56	41	136	17.0	56	216	9.2	56
	6	4		11			15	11	158	31.4	15	223	13.0	15
	7			1			1	1	112	NA	1	203	NA	1
	8			1			1	1	235	NA	1	233	NA	1
	9													
	10													
Sample Total		47	0	91	0	0	138	100	134	22.2	138	213	10.9	138
Sex Composition		34.1%	0.0%	65.9%	0.0%	0.0%								

^a Some of the 2004 samples were salted so weights likely do not accurately represent true live fish weight.^b Index of gonad maturity^c Index of gonad maturity^d Index of gonad maturity

Table 7.—Summary of age, sex, and size distribution of Pacific herring sampled by gillnet in Tuxedni Bay, Cook Inlet, 2001.

Sample Region	Age	Numbers of Fish						Percent of Total	Weight			Length		
		Male	Imm. ^a Female	Ripe ^b Female	Spawned ^c Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
2001	4	0	0	2	0	0	2	1%	130	9.6	4	216	8.9	4
Tuxedni	5	1	0	12	0	1	14	6%	139	18.7	54	224	10.6	54
Bay	6	31	0	21	0	0	52	21%	156	22.0	52	232	10.0	52
	7	35	0	25	0	0	60	24%	174	22.9	68	240	9.5	68
	8	38	0	19	0	0	57	23%	192	27.6	37	245	9.3	37
	9	21	0	17	0	0	38	15%	198	28.5	21	253	8.6	21
	10	11	0	5	0	0	16	6%	190	33.3	9	247	12.3	9
	11	6	0	1	0	0	7	3%	209	8.2	4	254	7.4	4
	12	2	0	1	0	0	3	1%	187	0.0	1	255	0.0	1
Sample Total		145	0	103	0	1	249	100%	167		250	236		250
Sex Composition		57.4%		41.0%		0.4%	100%							

^a Index of gonad maturity

^b Index of gonad maturity

^c Index of gonad maturity

Table 8.—Personal use harvest of smelt in Upper Cook Inlet, 1993–2003.

Year	Number	Pounds	Tons
1993	43,364	4,818	2.4
1994	66,242	7,360	3.7
1995	40,377	4,486	2.2
1996	42,101	4,678	2.3
1997	58,612	6,512	3.3
1998	49,694	5,522	2.8
1999	89,560	9,951	5.0
2000	54,915	6,102	3.1
2001	70,725	7,858	3.9
2002	80,486	8,943	4.5
2003	55,633	6,181	3.1

Note: Smelt harvest is considered personal use under sport fish regulations, but some respondents may confuse it with 'subsistence' and not report it on the Statewide Harvest Survey (SWHS) - therefore actual personal use harvest may be under-reported.

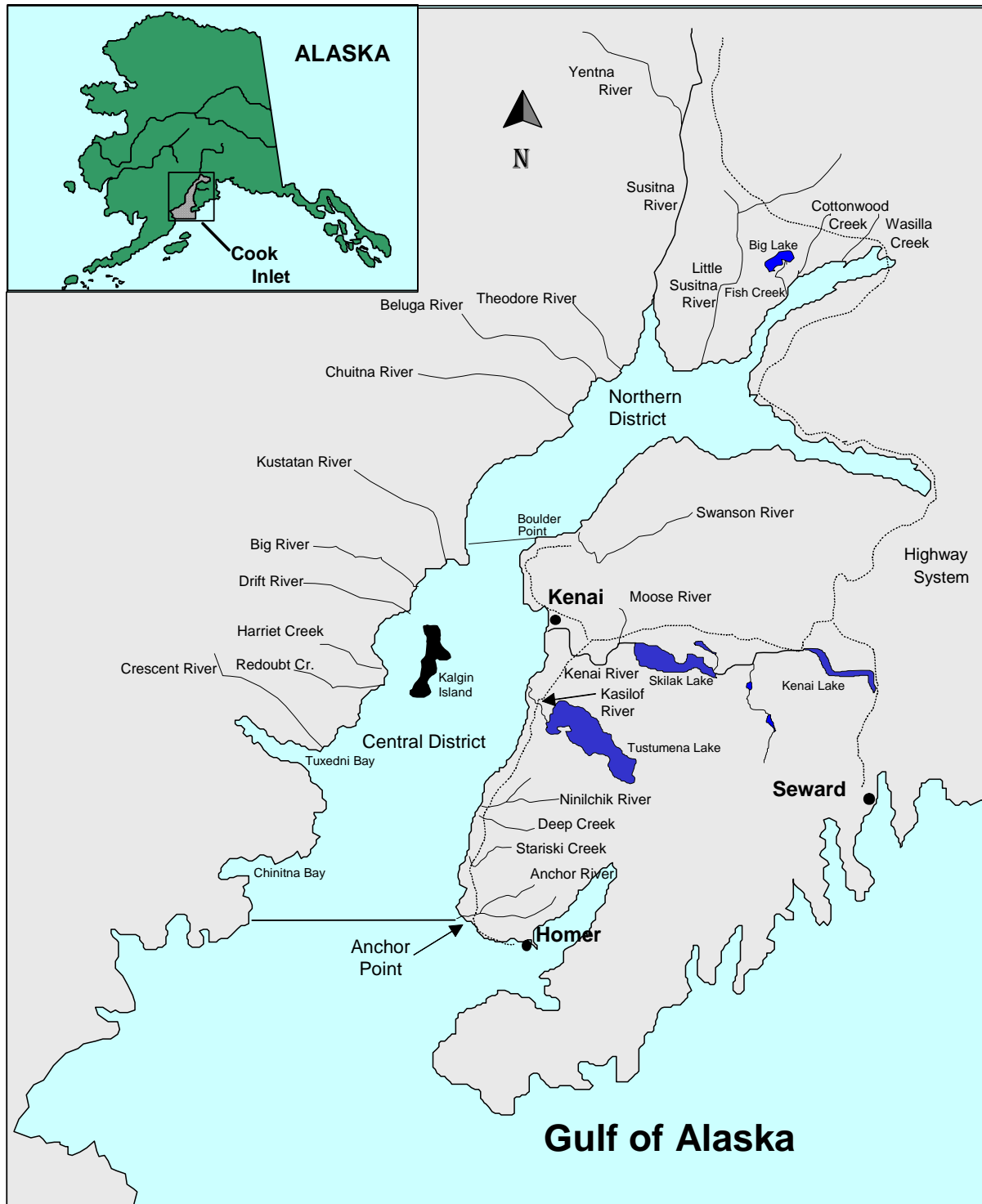


Figure 1.—Upper Cook Inlet Management Area.